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Teaching Decoding Through Constant Time Delay to Students with Severe Disabilities and Verbal Difficulties

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ABSTRACT

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The purpose of this study was to examine the effects of constant time delay on decoding letter sounds within consonant-vowel-consonant words and to read constant-vowel-constant words skills for students with severe disabilities and verbal difficulties. This study used a multiple probe across participants design with four students with severe intellectual and/or development disabilities. Results indicated a functional relation between the use of constant time delay and decoding of CVC words. Additionally, students were able to maintain and generalize learning. Results were similar to other studies which implemented constant time delay to promote emergent literacy skills. Practitioners can use constant time delay to teach decoding to students with severe disabilities and verbal difficulties and to promote early reading skills. Future research should replicate the study with students from different age groups as well as examine the effects of this strategy on the acquisition of CCVC and CVCC words.

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Chapter 1: Introduction

The Education of All Handicapped Children Act was first passed in 1975 to ensure that students with disabilities were receiving a free, appropriate, public education. Throughout several reauthorizations of this law, the most recent being the Individuals with Disabilities Education Improvement Act (IDEA) in 2004, it became required that special education teachers use research and evidence-based practices to teach their students (IDEA, 2004). This requirement has impacted special education in that researchers have increased their efforts to identify evidence-based teaching strategies and interventions for special education teachers to use, as well as conducting research that adds to the research or evidence base for a specific intervention.

Teaching Academics Versus Teaching Functional Skills

Before the paradigm shift to research and evidence-based practices came the discussion of what to teach students with disabilities—functional life skills or academic skills. This is still an issue that special education teachers face today. While functional life skills are crucial for all students to learn, the law states the students with disabilities must be provided with a free, appropriate, public education in the least restrictive environment with access to the general education curriculum (IDEA, 2004). This means that students with disabilities should be taught academically relevant and appropriate skills. Knight, Browder, Angello, and Lee (2010) discussed the importance of teaching academically relevant and standards-based content to individuals with severe disabilities along with functional life skills. Additionally, they suggest how standards-based content can be made accessible to students with severe disabilities, rather than assuming they are incapable of learning skills taught to their typically developing peers. However, not all researchers and educators believe that standards-based curriculum and

instruction is best for students with severe disabilities (Ayres, Lowrey, Douglas, & Seivers, 2011; Ayres, Lowrey, Douglas, & Sievers, 2012). Cooper-Duffy, Szedia, and Hyder (2010) reiterate that the passing of IDEA (2004) and discuss that the No Child Left Behind Act of 2001 (NCLB, 2002) calls for student with disabilities to be involved in mandatory state testing that is aligned with the state standards. Cooper-Duffy et al. (2010) outline three problems that special education teachers are facing to with the passing of these laws: (1) how to teach standards-based content in a way that students with severe disabilities can understand and show adequate yearly progress; (2) how to teach standards-based academic content for multiple students with differing disabilities, ages, and grade levels within the same class; (3) how to teach group lessons and in group settings when practices for teaching academics to students with severe disabilities mostly utilize a one-to-one instructional format. Regardless of these issues and disagreements, the law is clear: students with disabilities must be provided with access to the general education curriculum and educators and researchers should be supporting this endeavor.

Teaching Early Literacy and Reading to Students with Severe Disabilities

Teaching literacy and reading to students with severe disabilities is very important because reading enables individuals to access the world. Individuals with disabilities that are illiterate have a much harder time functioning as a part of modern-day society (Groce & Bakhshi, 2011). In today's world many things require reading, such as getting a job, voting, driving, applying for government assistance, shopping, and much more. If students with disabilities are unable to read, they will be dependent on others for many aspects of daily living that they could otherwise do themselves. It is due to these factors that reading and literacy can be viewed as both an academic and functional skill.

The literature on teaching reading to students with severe to profound disabilities has focused heavily on sight words (Spooner & Browder, 2015), but more recently, research has shown teaching phonics is a plausible option for reading instruction with this population (Dessemontet, Martinet, de Chambrier, Martini-Willemin, & Audrin, 2019). Sight word instruction is based on students being taught to memorize words and their meanings rather than learning how to sound out words. Phonics/decoding instruction is teaching students letter sounds and how those sounds blend together to create words. Spooner and Browder (2015) state that while reading instruction for students with severe disabilities has mostly been sight word based, special education teachers should "raise the bar" by teaching phonics and decoding skills. In fact, a meta-analysis by Dessemontet et al (2019) found that not only can phonics be taught to students with moderate to severe intellectual disability, but that most researchers used a direct instructional approach with a one-to-one format.

One practice identified as an evidence-based practice for both sight words and phonics is time delay. Constant time delay has been found as an evidence-based practice for teaching word and picture recognition for students with severe developmental disabilities (Browder, Ahlgrim-Delzell, Spooner, Mims, & Baker, 2009a). As a result, other researchers started to use constant time delay as an intervention for other academic skills (Courtade, Test, & Cook, 2014). It is important to note that time delay (progressive or constant) is a form of both direct instruction and systematic instruction. Constant and Progressive Time delay (C/PTD) is a response prompting strategy made up of two distinct rounds, the zero-delay round and the delay round. Additionally, CTD only includes one prompt, the controlling prompt, which is the prompt you know will elicit the targeted response for that particular student. For some students the prompt might be a model prompt because you know a model prompt will consistently result in them responding. But, for

other students, the prompt might be a physical prompt as in order to guarantee the student elicits the targeted response, a physical prompt is needed. In the zero-delay round, the instructor provides the task direction while immediately providing the controlling prompt, which ultimately should result in a correct response each time. Once the student is consistently responding correctly in the zero-delay round, the instructor should move to the delay round. In the delay round, the instructor provides the task direction, followed by a set wait time (e.g., 5 seconds). If the student does not respond correctly within that wait time, the instructor provides the controlling prompt. If the student attempts to make an incorrect response, the instructor should attempt to block the incorrect response and redirect the student to the correct response. If the student responds correctly within that set wait time, the instructor should provide a strong reinforcer.

Time delay is considered a form of systematic and direct instruction (Ahlgrim-Delzell, Mims, & Vintinner, 2014b). Systematic instruction includes "response and stimulus prompting (p. 89)" and direct instruction includes "careful program design which focuses on the big ideas, organization of instruction, and student teacher interactions (p. 93)." Explicit (direct), systematic instruction is also an evidence-based practice for teaching phonics to students without disabilities (National Reading Panel, 2000). Therefore, it is natural that an evidence-based direct, systematic instructional method, such as time delay, be used to teach students with severe disabilities the same skill set. Time delay (progressive or constant) has been used to teach many early literacy components including phonics (Browder et al., 2009; Cooper-Duffy et al., 2010; Earle & Sayeski, 2017; Knight et al., 2010; Spooner et al., 2012; Tucker-Cohen, Wolff Heller, Alberto, & Fredrick, 2008).

In their meta-analysis Dessemontet et al. (2019) stated, "Systematic phonics instruction is effective to teach decoding skills to students with ID [intellectual disability], as it is for typically developing children (p. 67)." Others have built upon Dessemontet et al.'s (2019) and Browder et al.'s (2009a) claims that students with disabilities can learn phonics by conducting research about students with disabilities and coexisting conditions— such as complex communication needs, low language abilities, use of augmentative and alternative communication, and other such conditions—and their ability to learn phonics and decoding skills through a variety of methods (Ahlgrim-Delzell et al., 2016; Ahlgrim-Delzell et al., 2014a; Ainsworth et al., 2016; Fallon2004; Johnston, Buchanan, & Davenport, 2009a; Johnston, Davenport, Kanarowski, Rhodehouse, & McDonnell, 2009b; Swinehart-Jones & Heller, 2009).

A critical study in teaching early literacy and reading skills to students with severe disabilities was a study conducted by Browder, Ahlgrim-Delzell, Courtade, Gibbs, and Flowers (2008). This study investigated the effects of a curriculum called the Early Literacy Skills Builder (*ELSB*; Browder, Gibbs, Ahlgrim-Delzell, Courtade, & Lee, 2007) to teach the following skills to students with significant (severe) intellectual and/or developmental disabilities: (a) read vocabulary sight words; (b) point to sight words to complete a sentence; (c) point to words as the teacher reads them aloud; (d) indicate/say words to fill in a repeated story line; (e) respond to a question about a story by selecting a picture, word, or verbally answering; (f) demonstrate understanding of segmentation by clapping out syllables in words; (g) demonstrate understanding of segmentation by tapping out phonemes in consonant-vowel-consonant words; (h) identify letter-sound correspondence; (i) identify the first and last sounds in words; (j) find pictures that begin/end with a specific sound; (k) point to pictures that represent segmented words; and (l) point to pictures of spoken words. The researchers use a variety of systematic and

direct instructional strategies to teach these skills including constant time delay (CTD), system of least prompts, and the model-lead-test strategy. While this research was an important contribution, it had serval limitations for teaching early literacy and reading skills to students with severe disabilities. One such limitation is that *ELSB* is curriculum that must be purchased and may not be an option for all teachers given limited classroom budgets or pre-adopted system wide curriculum. The *ELSB* also teaches a multitude of skills with different instructional strategies, and it is unclear whether these skills could be taught in isolation with the appropriate instructional strategy.

Students with Severe Disabilities and Verbal Difficulties Learning Phonics and Decoding Skills

Some research has occurred with a focus on students with severe disabilities and verbal difficulties and their ability to learn phonics, decoding, and other early literacy skills (Ahlgrim-Delzell, Browder, Wood, Stanger, Preston, & Kemp-Inman, 2016; Ahlgrim-Delzell, Browder, & Wood, 2014a; Ainsworth et al., 2016; Browder et al., 2008; Fallon et al., 2004). Ahlgrim-Delzell et al. (2014a) used GoTalk Phonics curriculum along with a GoTalk 32 express communication device, which utilized CTD and system of least prompts to teach a variety of phonics and literacy skills. These skills were phoneme identification, identification of the first sound in words, identification of segmented consonant-vowel-consonant words, blending sounds to form words, and blending sounds with picture referents. This research helped to provide evidence that students that are nonverbal are capable of learning phonics-based instruction. However, there were several limitations to this study. One such limitation is that the GoTalk Phonics curriculum was created only for the purpose of the study and is not available for purchase and/or further use. Another limitation would be that this study taught multiple skills using two different

instructional strategies (CTD and system of least prompts). Overall, the study supported the idea that student with disabilities who are nonverbal can learn phonics through systematic instruction.

A continuation of the Ahlgrim-Delzell et al. (2014a) study was the Ahlgrim-Delzell et al. (2016) study. Ahlgrim-Delzell et al. (2016) found the Early Reading Skills Builder (ERSB) curriculum blended with the GoTalk Now iPad application to be effective in teaching students with severe disabilities that used alternative and augmentative communication devices (AAC) to teach a variety of early reading. The following were the early reading skills taught: (a) identify phonemes in isolation, (b) identify phonemes in words, (c) segment sounds in words, (d) blend sounds to identify words, (e) decode words to identify pictures, (f) identify sight words, (g) read connected texts, and (h) answer literal comprehension questions about a text. The *ERSB* curriculum was designed to be the next step after the *ELSB* curriculum. The *ELSB* curriculum was used to teach a variety of comprehension, phonemic awareness, phonics, and vocabulary skills to students with significant disabilities, 45.5 percent which were considered nonverbal (Browder et al., 2008). Due to this link, the Ahlgrim-Delzell (2016) study has similar limitations to the Browder et al., (2008) study. One such limitation would be the expense. In order to utilize this intervention, schools/school districts would need to purchase the *ERSB*, iPads, and the GoTalk Now application which could be very expensive depending on the number of students needing the intervention. Another limitation is that it teaches a variety of different skills using different instructional methods (i.e., CTD and system of least prompts). Ahlgrim-Delzell et al. (2016) also called for future research to build comprehension into early phonics instruction.

Another study that focused on teaching phonics and decoding to students with severe disabilities and verbal difficulties was a study by Ainsworth et al. (2016). They used the Accessible Literacy Learning (*ALL*) curriculum to teach phonics and decoding to middle school

students with severe developmental/intellectual disabilities, and complex communication needs though model-lead-test-based instruction. Ainsworth et al. (2016) primarily focused on the letter-sound correspondence component of the curriculum and found a functional relationship between the *ALL* curriculum and the acquisition of letter-sound correspondence within the previously mentioned population. While this study was successful for teaching letter-sound correspondence to middle school students with severe disabilities and complex communication needs, the study did not follow up with a demonstration of reading the whole word. This is critical for the functionality of teaching decoding.

Another study featuring teaching reading to students with severe disabilities who used Augmentative and Alternative Communication (AAC) was a study by Fallon et al. (2004). The researchers implemented a direct instruction intervention with the following components using a discrete trail and model-lead test format: matching single sounds to the initial sounds of words, telescoping sounds into words, and reading single vowel-consonant and consonant-vowel-consonant words. They found a functional relation between the intervention and single word reading. While this study added to the research about teaching literacy and reading skills to students with severe disabilities and verbal difficulties, the focus was on sight word instruction versus decoding.

Given the lack of robust research base focused on teaching students with severe intellectual or developmental disabilities who also experience verbal difficulties to read words through traditional decoding and phonics instruction, additional research is needed. While studies have been conducted on teaching phonics and decoding through direct instruction to students with disabilities (Browder et al., 2008; Browder et al., 2012; Earle and Sayeski, 2017; Lemons et al., 2012; Tucker Cohen et al., 2008) and students who use AAC devices (Ahlgrim-

Delzell et al., 2014a; Ainsworth et al., 2016; Fallon et al., 2004; Swinehart-Jones and Heller, 2009),and studies using time delay and/or system of least prompts to students who use AAC devices (Ahlgrim-Delzell et al., 2014a; Johnston et al., 2009), to date, studies have yet to exclusively focused on using CTD to teach phonics and word reading to students with severe intellectual or developmental disabilities who also have verbal difficulties. Therefore, the purposes of this study were to:

1. Determine the effects of constant time delay on letter sounds identification within consonant-vowel-consonant words for students with severe disabilities and verbal difficulties.

2. Determine the effects of constant time delay on CVC word reading for students with severe disabilities and verbal difficulties.

3. Determine if the above skills can be maintained and generalized by students with severe disabilities and verbal difficulties.

Chapter 2: Literature Review

Teaching phonics and decoding skills is something that is a vital part of curriculum in the general education setting. However, literacy instruction in special education is primarily sight word based (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006). This study evaluated whether students with severe disabilities and verbal difficulties can learn to read through decoding, and if they can also apply the skill to independently read and sound out words that have not been explicitly taught.

Teaching Academics to Students with Significant Disabilities

IDEA (2004) is the main law that governs special education. This law outlines special education services and the process in which students can receive services. Students that receive special education services are entitled to a free appropriate public education in their least restrictive environment. Students who qualify for special education services also receive an Individual Education Program (IEP). This IEP includes data-based information about the students' present levels of academic achievement and functional performance. Based upon this information academic and functional educational goals are created to structure the IEP and any supports, services, accommodations, and modifications needed to reach these goals are included. IDEA also ensures that students with disabilities have access to the general education curriculum, meaning that they should have access to learning that involves relevant state standards and looks similar to that of their typically developing peers.

There has often been a debate in the field of special education, especially in regard to students with severe disabilities, about whether instruction should be based more on functional or academic skills. This became very apparent, and controversial, when three back and forth

discussion papers were published in 2011 and 2012 (Ayres, Lowrey, Douglas, & Sievers, 2011; Ayres, Lowrey, Douglas, & Sievers, 2012; Courtade, Spooner, Browder, and Jimenez, 2012). The discussion began when Ayres et al. (2011) asked "At what point does working toward fragmented, watered down academic standards become less important than working towards meaningful individualized curricula directly tied to increasing independence in identified current and future environments (p. 12)" in regard to teaching curricula for students with severe disabilities shifting to being based on general education state standards (i.e., common core state standards). In a reply article Courtade et al. (2012) identified seven reasons to use standards-based instruction to teach students with severe disabilities, including: (a) students with severe disabilities have a right to a full educational opportunity, (b) a standards-based curriculum is relevant to students with severe disabilities, (c) we [researchers] do not yet know the potential of students with severe disabilities, (d) functional skills are not a pre-requisite to learning, (e) standards-based curriculum is not a replacement for functional curriculum, (f) individualized curriculum is limited when that is the only curriculum, and (g) students are creating the changing expectations with their own achievements. They also state that not all teachers, parents, and students approve of standards-based curriculum and instruction, but that "this is true not only for students with severe disabilities but for all students in the overall standards-based reform" (p. 9) in schools across the nation. Ayres et al. (2012), concludes with saying that there should be a balance between standards-based instruction and functional skill instruction and that curricula should be personally relevant to students with severe disabilities. Regardless of this debate, the law is clear: students with disabilities should have relevant functional and academic goals within their IEP and should be receiving a free appropriate public education in their least restrictive environment that includes access to the general education curriculum.

Since IDEA (2004) mandates that functional and academic skills be taught to individuals with disabilities many scholars have researched the results of both functional and academic skills on the education of students with disabilities (Knight et al., 2010; Spooner et al., 2012; Spooner & Browder, 2015). Spooner and Browder (2015) identified three significant advances in instruction for students with severe disabilities: (a) behavior conditioning being used with individuals with disabilities; (b) students with disabilities being taught functional skill; and (c) students with disabilities being included in standards-based school reforms.

Despite many achievements having been made in the educational instruction of students with disabilities there is still more to be done. Spooner and Browder (2015) specifically identify that special educators will need "deep knowledge of general education; expertise in augmenting general curriculum with communication, social, and functional skills; specialized instructional practices; and skill in teaming with professionals (pp. 30-31) " to provide effective education for students with severe disabilities. Knight et al. (2010) reviewed effective instructional strategies for teaching students with severe disabilities skills in English Language Arts (ELA), mathematics, and science, as well as their various sub-categories. They identified that along with research-based strategies (i.e., time delay and task analysis) teachers can use the universal design for learning (UDL), explicit instruction, embedded instruction, and peer-mediated instruction to teach academic skills and concepts to students with severe disabilities. Spooner et al (2012) discussed the evidence-based teaching practices for teaching students with severe disabilities various academic content focusing on studies that taught acquisition of a skill in literacy, mathematics, or science. These evidence-based practices included: task analytic instruction and time delay instruction in both chained (multi-step) and discrete (single step) responses.

Using Systematic Instruction through Time Delay to teach ELA Skills

Systematic instruction is defined as, response and stimulus prompting strategies that are used with error correction and reinforcement strategies. Response prompting strategies include time delay (progressive and constant), simultaneous prompting, system of least-to-most prompts, system of most-to least prompts, and gradual guidance. Stimulus prompting strategies include superimposition, stimulus shaping, and stimulus fading (Ahlgrim-Delzell et al., 2014b). Systematic instruction via time delay has been shown to be an evidence-based practice for teaching academic skills, such as ELA, in various studies (Browder et al., 2008; Cooper Duffy et al, 2010; Knight et al., 2010; Spooner et al., 2012). Time delay is a teaching strategy that provides errorless learning. Time delay consists of the following: (a) a zero-delay round in which the response stimulus and the prompt are provided simultaneously, and (b) a predetermined delay amount is applied between the response stimulus and the prompt. The number of zero-delay rounds is individualized for each student, and then the instructor moves on to the delay rounds (progressive or constant). (c) In constant time delay, a set amount of time is placed between the stimulus to respond and the prompt or as in progressive time delay, the wait time increases each trial (e.g., 1 second, 2 seconds; of 2 seconds, 4 seconds, 6 seconds) before the instructor delivers the prompt. An example of progressive time delay scheduling would be: zero-time delay for 3 trials, start with 2 second delay, then in every additional trial increase the time delay by 2 seconds (e.g., 2, 4, 6, etc). Spooner et al. (2012) and Knight et al. (2010), identified constant and progressive time delay as evidence-based practice for a variety of educational subjects including ELA, mathematics, science, and other academic skills.

Several studies have specifically identified time delay as effective for teaching literacy or components of literacy to students with disabilities (Browder, Ahlgrim-Delzell, Spooner, Mims,

& Baker, 2009; Browder, Gibbs, Ahlgrim-Delzell, Courtade, Mraz, & Flowers, 2009; Cooper-Duffy et al., 2010). Browder et al. (2009a) conducted a literature review of research on time delay and concluded that it met the criteria for an evidence-based practice for teaching early symbol recognition to students with moderate intellectual disabilities. However, due to limited numbers of students with severe disabilities, they could not conclude whether time delay was an evidence-based practice for teaching early symbol recognition for this specific population. This was due to the lack of studies with the necessary quality indicators identified by Horner et al. (2005) for single case design. Browder et al. (2009a) called for more studies of time delay for teaching early symbol recognition that met the quality indicators outlined by Horner et al. (2005).

Browder et al. (2009b), looked at the many aspects of teaching literacy to students with severe disabilities. One noted outcome of this review was the idea that teaching students to become independent readers involved many instructional strategies such as sight word instruction and time delay procedures. Copper-Duffey et al. (2010) followed up with a list of six distinct steps for teaching literacy to students with significant cognitive disabilities. These steps include using systematic instruction, such as time delay, to teach discrete skills to help increase skill acquisition and reach specific literacy based IEP goals. Phonemic awareness, phonics, vocabulary, fluency, and comprehension have been found to be vital for teaching students with severe developmental disabilities to become independent readers (Browder et al., 2009b).

Teaching Phonics and Decoding versus Sight Words

Literacy instruction for students with severe disabilities has often focused on sight words, rather than the phonics and decoding approach procedures used in general education settings (Browder et al., 2008; Browder, Ahlgrim-Delzell, Flowers, & Baker, 2012; Browder et al.,

2009a; Browder et al., 2009b; Cooper-Duffy et al., 2010; Dessemontet, Martinet, de Chambrier, Martini-Willemin, & Audrin, 2019; Spooner and Browder, 2015; Spooner et al, 2012; Swinehart-Jones & Heller, 2009). While students with severe disabilities have been successful in learning sight words, the science of reading highlights the importance of phonics and decoding procedures (National Reading Panel, 2000). Historically the science of reading has not been applied with students with intellectual disabilities. More recently, research has shifted to include students with intellectual disabilities in studies focusing on teaching phonics and decoding. In fact, Dessemontet et al. (2019) conducted a meta-analysis of the effectiveness of teaching phonics on the decoding skills of students with intellectual disabilities (ID). They analyzed 14 studies examining phonics instruction for students with intellectual disability. Results indicated that most of the studies utilized systematic and direct instruction in a one-to-one instructional format and that time delay is mostly used in a one-to-one instructional format when teaching students with severe disabilities phonics and decoding skills. Additionally, the analyses noted that students with ID who benefited from phonics instruction could transfer and generalize their decoding skills to read untaught words and non-words, similarly to their non-disabled peers.

Teaching Phonics and Decoding using Direct Instruction to Students with Disabilities

A number of studies have examined teaching phonics and decoding to students with varying types of disabilities (Ahlgrim-Delzell et al., 2014a; Ainsworth et al., 2016; Browder et al., 2008; Browder et al., 2012; Earle & Sayeski, 2017; Fallon et al., 2004; Johnston et al., 2009b; Lemons, Mrachko, Kostewicz, & Paterra, 2012; Swinehart-Jones et al., 2009; Tucker Cohen et al., 2008). One of these studies was Browder et al.'s (2012) continuation of investigating the *ELSB* curriculum (Browder, Gibbs, Ahlgrim-Delzell, Courtade, & Lee, 2007) and its effects on the literacy skills of individuals with severe disabilities. A major component of

the *ELSB* includes phonics and phonemic awareness instruction objectives such as clapping out syllables, tapping out letter sounds, letter-sound correspondence, identifying first and last sounds, and identifying pictures that begin or end with certain sounds using CTD and/or system of least prompts. There are other aspects of literacy addressed in this curriculum that are not phonics related, including comprehension and vocabulary that are also taught using CTD and/or system of least prompts.

In the Browder et al. (2012) study and the Browder et al. (2008) study a randomized control trial was conducted to investigate the effects of a scripted, multicomponent curriculum (*ELSB*) as compared to sight word-based curriculum called *Edmark*. Students were randomly assigned to the treatment group, the *ELSB*, or the control group, *Edmark*. The study showed that over three years students receiving the *ELSB* curriculum achieved high scores on the *Peabody Picture Vocabulary Test III* (Dunn, 1997) and specific sections of the *Nonverbal Literacy Assessment* (NVLA; Ahlgrim-Delzell, Browder, Flowers, & Baker, 2008) which measured phonics skills and overall reading ability. This study suggests that phonics embedded within a curriculum can help students with severe disabilities increase their phonics and reading instruction. The *ELSB* was not used within this study due to the expense of the box curriculum as well as the fact that it does not focus on phonics-based instruction only.

Another study that highlighted phonics instruction for students with disabilities was a study by Earle and Sayeski (2017). They used the model-lead-test strategy, popularized by Archer and Hughes (2011), to teach letter-sound correspondence. Their analysis indicated that direct, explicit, and systematic instruction was effective in teaching letter-sound correspondence to students with reading disabilities or students who were struggling to read. Lemons et al. (2012), examined phonics skills achievement for students with Down Syndrome using three

different direct instruction programs. The reading interventions were the Road to Reading (RTR; Blachman & Tangel, 2008), Road to Reading with a Phonological Activity (RTR+PA), and the Road to the Code (RTC; Blachman, Ball, Black, & Tangel, 2000). The RTR and RTR+PA decoding interventions were moderately effective in improving the reading of phonetically regular words and high frequency words in students with Down Syndrome. This study did not include students with severe disabilities and verbal difficulties. The RTR, RTC, and RTR+PA were not used in this study because of their expense as well as their use of model-lead-test versus CTD.

Subsequently Tucker Cohen et al. (2008) conducted a study regrading teaching phonics and decoding using direct instruction strategies. They utilized time delay along with a three-step decoding strategy to teach word reading to students with mild to moderate intellectual disabilities. The three steps included identifying the word, sounding out each letter, and blending the sounds to say the word. All participants showed improvement in word reading skills using this decoding strategy and constant time delay. Similarly to their typically developing peers, studies show that direct and explicit instruction of phonics skills can increase the word reading abilities of students with disabilities (Browder et al., 2008; Browder et al., 2012; Earl & Sayeski, 2017; Lemons et al., 2012; Tucker Cohen et al., 2008). One limitation to this study is that it did not include students with severe disabilities. Another limitation was that participants in this study did not experience verbal difficulties.

Teaching Phonics and Decoding to Students who use AAC Devices

It appears that students with a variety of disabilities can benefit from direct and systematic phonics instruction, and increase their literacy skills, even if they are nonverbal and/or use augmentative and alternative communication (AAC) devices. One such study by

Ahlgrim-Delzell et al. (2014a) used systematic instruction and an AAC device to teach phonics skills to students with moderate disabilities who were non-verbal. Using a curriculum called *GoTalk Phonics* (Stranger, 2011), installed on the GoTalk 32 express communication device. They found that students were able to increase three phonics skills—phoneme identification, blending sounds to form words, and blending words with picture referents.

Another study that investigated teaching phonics and decoding to students who use AAC devices was conducted by Ainsworth et al. (2016). They used the phonics section of the *Accessible Literacy Learning* (*ALL*) curriculum to assess letter-sound correspondence. This study was conducted with students with severe disabilities who were nonverbal or had complex communication needs that limited their ability to communicate effectively. Results indicated that the phonics section of the *ALL* curriculum increased students' letter-sound correspondence. Fallon et al. (2004) used a three-component direct instruction strategy to teach phonics to students with disabilities with speech intelligibility under 30 percent. The three-component strategy consisted of matching single sounds to the initial sounds of words, telescoping sounds into words, and reading vowel-consonant (VC) and consonant-vowel-consonant (CVC) words. They tested word reading of novel words and in book contexts. Fallon et al (2004) found that this intervention was effective in teaching word reading to their students. This intervention was not used due to its basis being in sight-reading rather than decoding and its lack of applied comprehension using picture supports. Swinehart-Jones and Heller (2009) studied the effects of the systematic phonics instruction of the *Nonverbal Reading Approach* (*NRA*; Heller, Fredrick, Tumlin, & Brineman, 2002) on four students with severe speech and physical impairments, such as cerebral palsy who were mostly nonverbal and relied on AAC devices to communicate. This

method was effective in teaching a targeted set of words to the four students in that study. One limitation to this study is that participants in this study did not have severe cognitive delays.

Teaching Phonics and Decoding using Time Delay to Students who use AAC Devices

Two studies showed that students with intellectual disabilities who are nonverbal, or have a limited verbal repertoire and use AAC devices, can learn phonics instruction through time delay to increase their literacy skills (Ahlgrim-Delzell et al., 2014a; Johnston et al., 2009). Ahlgrim-Delzell et al. (2014a) used the *Early Reading Skills Builder* and the *GoTalk Now* iPad app along with time delay and the system of least prompts to teach the following phonics skills to a group of students with developmental disabilities, segmenting, decoding, identifying sight words, and comprehension after reading a decodable short passage. They used curriculum-based measures (CBMs) to test phoneme identification, blending sounds to identify words, and decoding for picture-word-matching. Results indicated there was a functional relationship for phoneme identification and decoding for picture-word-matching, but not for blending sounds to identify words. Additionally, Johnson et al. (2009b) used a three-step intervention strategy with time delay to teach letter-sound correspondence and CVC words to preschoolers who use AAC devices. The steps included (a) the students selecting one of two presented activities that involved adult-directed teaching and active teacher-child interaction, (b) the teacher/interventionist to provide the instructional cue and response prompt and for the student to respond, and (c) the teacher/interventionist to provide the appropriate consequence. The results of the study showed that the intervention was effective in teaching letter sounds and CVC words.

Chapter 3: Methods

This study used constant time delay to teach a three-step decoding process for word reading using researcher-made materials. Measures of social validity were gathered during the study. This study utilized a multiple probe across participants design to assess whether the intervention teaching the three-step decoding process using constant time delay positively affected the students' knowledge of letter sounds and word names through decoding.

Participants

The inclusion criteria for this study were special education students who (a) have severe intellectual or developmental disabilities (i.e., IQ equal to or less than 40 or within the -3.00 z-score of the developmental inventory used), (b) experience language and verbal difficulties (e.g., nonvocal verbal, lacking functional communication), (c) are in K-5th grade, (d) whose current literacy instruction is not phonics-based, (e) have an ELA related IEP goal, (f) have adequate attendance, and (g) have hearing and vision within normal limits. Once identified, the researcher sent home more information about the study as well as an Institutional Review Board (IRB)-approved informed consent document for the parents and/or guardians to read and sign should they give consent for their child to participate. Participants were also verbally asked for their assent to participate in the study through an IRB- approved script that explained the study in terms that the participant could understand. A record review was completed to verify disability(ies), grade level, IQ and other relevant test scores, and IEP goals. See Table 1 for a summary of participant information.

Table 1

Participant Information

Student Name	Age/Grade	Ethnicity	Disability	IQ and Determining Test	Pertinent Educational History	Verbal Abilities
Super Hero	Third Grade 9 Years Old	Caucasian	Intellectual Disability, Down Syndrome, Acute Myeloid Leukemia (AML-in remission)	WISC-V: Full Scale IQ- 40 (<0.1%ile)	WRAT-4: Word Reading: 55, 0.1%ile Spelling: 55, 0.1%ile	Responds to yes or no questions; speech is unintelligible; receives SLP services
Ninja Turtle	Kindergarten 5 Years Old	African American and Caucasian	Developmental Delay	Battelle Cognitive Test: Score 55 (-3.00 Z score)	Battelle Developmental Inventory-Second Edition (BDI-2): Echolalia Informal Language Sample: Severe delays in receptive, expressive, and pragmatic language	Echolalic; speech is not used to communicate; receives SLP services
Ben Ten	Kindergarten 5 Years Old	Caucasian	Autism	Battelle Cognitive Test: Score 55 (-3.00 Z score)	Battelle Developmental Inventory 2nd edition: Personal/social: 55, -3.00 z-score Communication: 55, -3.00 z-score Cognitive: 55, -3.00 z-score	Speech is unintelligible; only vocalizes when upset or happy; receives SLP services

Mickey Mouse	First Grade 8 Years Old	Caucasian	Autism	Unable to test	Language Skills: functional language skill delay, echolalia, and repetitive speech.	Echolalic; speech is not used to communicate; receives SLP services

Participant One: Super Hero. Super Hero (all participants chose their own pseudonym) was a third grade, Caucasian, nine-year-old male with intellectual disability, Down syndrome, and Acute Myeloid Leukemia (AML- in remission) and a full-scale IQ of 40 (WISC-V). His scores on the WRAT-4 included being in the <0.1 percentile in word reading and spelling. While Super Hero was capable of speech, his speech was often unintelligible and not functional. When asked a question, Super Hero would usually only respond with a "yes or a "no" and if the question was open-ended (i.e., What sound does this letter make?) he would just look at the questioner. When prompted he would repeat sounds and words. Super Hero received speech-language therapy at school where he worked on verbal communication skills. Super Hero was primarily educated in a self-contained classroom for all academic subjects including English-Language Arts (ELA). For the purpose of this study he was in Classroom 1 for the entirety of the study. His ELA related IEP goal was, "Given flashcards with single letters, Super Hero will tell/identify the letter name with 80% accuracy for 3/5 trials." Super Hero had a history of adequate attendance and hearing and vision within normal limits. See Table 1 for participant summary.

Participant Two: Ninja Turtle. Ninja Turtle was a kindergarten, African American and Caucasian five-year-old male with a developmental delay (Battelle Cognitive Test score of 55; -3.00 Z score). According to the Battelle Developmental Inventory-Second Edition (BDI-2) Ninja Turtle did not use words to express or communicate appropriately, but rather repeated what is

said (echolalia); and according to informal language sample analysis/observation Ninja Turtle had severe delays in receptive, expressive, and pragmatic language. Ninja Turtle also received speech-language therapy at school where he worked on verbal communication skills. Ninja Turtle was primarily educated in a self-contained classroom for all academic subjects including English-Language Arts (ELA), for the purpose of this study he was in Classroom 2 initially and moved to Classroom 1 during the study. His ELA related IEP goal was, "With adult prompting and guidance, the student will attend to learning tasks individually or with a group and name letters with 80% accuracy 75% of the time based on a teacher checklist." Ninja Turtle had a history of adequate attendance and hearing and vision within normal limits. See Table 1 for participant summary.

Participant Three: Ben Ten. Ben Ten was a Kindergarten, Caucasian five-year-old male with Autism (Battelle Cognitive Test score of 55; -3.00 Z score). While Ben Ten was capable of speech, his speech was often unintelligible, and he would often not speak to people with whom he was not familiar. Ben Ten also had a very limited vocabulary repertoire and did not like to verbally communicate unless he was very excited or very upset about something. Ben Ten received speech-language therapy at school where he worked on verbal communication skills. Ben Ten was primarily educated in a self-contained classroom for all academic subjects including English-Language Arts (ELA), for the purpose of this study he was in Classroom 2 initially and moved to Classroom 1 during the study. His ELA related IEP goal was, "Given small group instruction, modeling, and structured drill and practice activities, the student will begin to use /p/, /b/, and /m/ sounds correctly in CVC words with 80% accuracy." Ben Ten had a history of adequate attendance and hearing and vision within normal limits. See Table 1 for participant summary.

Participant Four: Mickey Mouse. Mickey Mouse was a first grade, Caucasian eight-year old male with Autism and an undetermined IQ. According to informal language sample analysis/observation, Mickey Mouse had a functional language skill delay, echolalia, and repetitive speech. When asked a question, Mickey Mouse would usually only respond with a "yes or a "no" and if the question is open-ended (i.e., What sound does this letter make?) he would just repeat the question. Mickey Mouse was primarily educated in a self-contained classroom for all academic subjects including English-Language Arts (ELA), for the purpose of this study he was in Classroom 2 for the entirety of the study. His ELA related IEP goal was, "Given various reading materials such as flashcards, the student will read or identify 50 sight words independently with 80% accuracy for 4/5 opportunities." Mickey Mouse had a history of adequate attendance and hearing and vision within normal limits. See Table 1 for participant summary.

Setting

This study was conducted in a rural area in the southeastern United States at an Elementary School in an urban school district. The self-contained classrooms in this study were for students with moderate to severe intellectual and developmental disabilities for students ages 5-11 and were the only ones in the school district; therefore, the students in those classrooms were from various places in the district not just the area zoned for the school (See school demographics in Table 2). Pod D has six classrooms, four self-contained classrooms and two sixth-grade classrooms, and a common space with a large rectangular table, cubbies for student use, an aquarium that the fifth and sixth grade CDC classroom uses, a refrigerator, a food storage cabinet, and a microwave.

Table 2

School Demographics (https://reportcard.tnk12.gov)

Category	*Percentage of Students (n=385)*
Gender	
Female	51.2
Male	48.8
Race	
Asian	2.9
Black or African American	5.2
Caucasian	88.6
Hispanic or Latino	2.6
Native American or Alaskan Students	0.8
Native Hawaiian or Pacific Islanders	0.0
Specific Groups	
Economically Disadvantaged	26.2
English Language Learners	0.5
Students with Disabilities	20.5
Additional Key Student Groups	
Students in Foster Care	0.0
Students who are Homeless	2.1
Students who are Migrants	0.0
Students with a Parent who is on Active Duty in Armed Forces	1.3

Initial Classroom Set-up

Classroom 1. Second through fourth grade self-contained classroom that had 11 students with a variety of disabilities, one teacher with a master's degree in special education, one paraprofessional with a degree in occupational therapy (not licensed), and one paraprofessional with some college course experience. The students in this classroom had various functional levels including some students who were working on sight word recognition, while other were working on reading leveled readers. The classroom was set up with a Promethean smart board screen at the front of the room with a large rug on which students sat during whole group instruction and three tables at which students sat during small group instruction/stations or free

time. Intervention took place at one of the tables during whole group instruction, and on the carpet during small group instruction. During the intervention, the target student was pulled to join the interventionist at one of the tables or the carpet.

Classroom 2. Kindergarten and first grade self-contained classroom that had ten students with a variety of disabilities, one teacher with a bachelor's degree in special education, and two paraprofessionals with some college course experience. The students in the classroom were working on a variety of skills including reading and recognizing sight words, while others were working on letter recognition and one and two letter sight words e.g., my, to, in, a, I, on, etc.). The classroom was set up with a Promethean smart board screen at the front of the room with a large rug on which students sat during whole group instruction and three tables for students to work at during small group instruction/stations or free time. Intervention took place at one of the tables during whole group instruction, and on the carpet during small group instruction.

Post-Midyear Break Classroom Set-up. Due to concerns from teachers and administration regarding student success and behavior, after the Midyear Break these two classrooms changed. Classroom 1 became an "academics" focused class and Classroom 2 became a "behavior" intervention focused class. The teacher from classroom 1, Mrs. B, and the teacher from classroom 2, Mrs. G, would split their time between the classrooms. In the morning Mrs. B and her paraprofessionals would be in classroom 1 and in the afternoon Mrs. B and her paraprofessionals would be in classroom 2 and vice versa for Mrs. G and her paraprofessionals.

Classroom 1. Kindergarten through fourth grade academics focused self-contained classroom that had 12 students with a variety of intellectual and developmental disabilities, one teacher with a master's degree in special education, one paraprofessional with a degree in occupational therapy (not licensed), and one that was substitute teacher. The students in this

classroom had various functional levels including some students who were working on letter recognition and one and two letter sight words (e.g., my, to, in, a, I, on, etc.), while other were working on reading leveled readers. The classroom was set up with a Promethean smart board screen at the front of the room with a large rug on which students sat during whole group instruction and three tables at which students sat during small group instruction/stations or free time. Intervention took place at one of the tables during whole group instruction, and on the carpet during small group instruction.

Classroom 2. Kindergarten through fourth grade behavior intervention focused self-contained classroom that had five students with a variety of disabilities, one teacher with a bachelor's degree in special education, and two paraprofessionals with some college. The students in this classroom were working on a variety of activities such as attending to a lesson, using communication boards, and working on academic skills. The classroom was set up with a Promethean smart board screen at the front of the room with a large rug in front on which students sat during whole group instruction and three tables at which students sat during small group instruction/stations or free time. Intervention did not take place in this setting.

Materials

The materials used in this study included several researcher made manipulatives and a regular, black, trifold, choice board by Augmentative Resources (see Figure 1). The researcher made manipulatives included four-inch by six-inch laminated index cards with consonant-vowel-consonant (CVC) words printed on them with marker in the participants preferred color (see Table 3); small laminated pictures on one-and-one-half inch squares; and four-inch by six-inch laminated index cards with one-inch by three-inch windows (see Figure 2). The materials were very low cost (e.g., lamination, color ink, printer paper, index cards, markers, velcro dots) and

low effort to prepare. Additionally, researcher created data sheets to monitor student progress and record data and procedural fidelity sheets to monitor the researcher's procedural fidelity were created (see Figures 3 and 4).

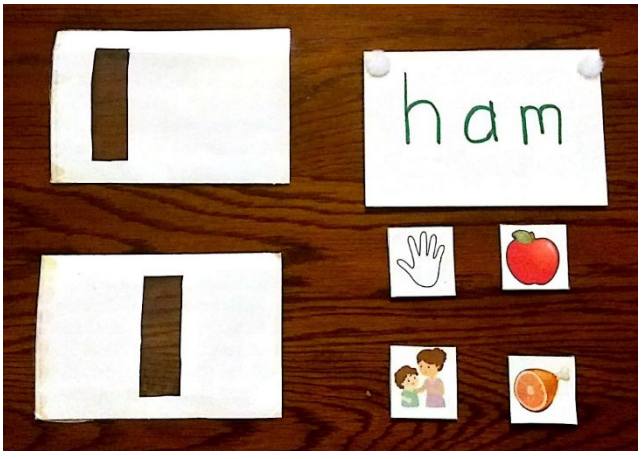
Figure 1

Regular, Black, Trifold, Choice Board by Augmentative Resources

Figure 2

Researcher Made Materials

Figure 3



Data Sheet

Table 3

Word 5																							
Word 4																							
Word 3																							
Word 2																							
Word 1																							
	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W
	Probe 1				Probe 2				Probe 3				Probe 4				Probe 5				Probe 6			
% Word																								
% Letter																								

Word 5																							
Word 4																							
Word 3																							
Word 2																							
Word 1																							
	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W	L1	L2	L3	W
	Probe 7				Probe 8				Probe 9				Probe 10				Probe 11				Probe 12			
% Word																								
% Letter																								

KEY:

+ = Correct – = Incorrect

Participant CVC Words

Participant	*Original Words*	*Generalization Words*
Super Hero	rat, web, zip, dog, hum	zap, red, pig, hot, gum
Ninja Turtle	fan, leg, sit, mop, cub	map, ten, fig, dog, sun
Ben Ten	ham, ten, dip, log, bus	map, leg, sit, dog, hum

Mickey Mouse	map, red, fig, hot, sun	n/a

Design

This study employed a multiple probe across participants single case design. In a single case design a student's baseline data serves as their own control (Kratochwill, Hitchcock, Horner, Levin, Odom, Rindskopf, & Shadish, 2010). In this study, baseline consisted of at least five probes and intervention was staggered across participants to show external validity. Students entered intervention one at a time based on current recommendations for multiple probe across participants singe case design (Lane, Ledford, & Gast, 2017).

Dependent Variable (DV). The DV was the percentage of CVC letter sounds correctly identified. A secondary DV was the percentage of CVC words correctly identified and decoded, which consisted of sounding out each letter and blending the sounds to read the word. Data were collected on both DVs. However, for the purpose of this study, the recognition of letter sounds was the primary DV and was used to make decisions regarding entering intervention, maintenance, and generalization. The DVs were measured by taking the amount of either correctly identified letter sounds or words and dividing it by the total (i.e., 15 for letter sounds and 5 for words) and multiplying it by 100 to provide a percentage. For example, if the participant correctly identified four letter sounds the correctly identified letter sounds would be four out of 15 which is equivalent to 26.7 percent. Classroom teachers, Mrs. B and Mrs. G, were provided with social validity questionnaires both before and after intervention to assess whether they thought the intervention would be effective and if the intervention could be effectively used in their classrooms.

Interventionist. The interventionist was the author and researcher of this study. She had a bachelor's degree in special education with a low incidence disability focus and was in her final year of seeking a master's degree in special education with an advanced studies focus. This study served as her thesis and culminating experience for her master's requirements.

Data Collection. Data collection for the dependent variable occurred in the participant's classroom during ELA instruction, which occurred from approximately 9:00 AM until 11:00 AM daily. Data collection probes were taken daily except for the following conditions: days in which the school was not in session, days in which ELA class did not take place (e.g., field trips, school assemblies, school wide testing, etc.), and days in which the participant was absent. The researcher implemented the intervention as well as collected data on the DV.

Interobserver Agreement. Interobserver agreement (IOA) occurred at least 20 percent of the time across both baseline and intervention conditions for each student—usually once per week. Two individuals (i.e., an undergraduate honors in special education student, masters in special education student) were trained to collect IOA. IOA criterion was set to 85 percent or above.

Procedural Fidelity. Procedural fidelity occurred at least 20 percent of the time—usually once per week. Two individuals (i.e., an undergraduate honors in special education student, masters in special education student) were trained to collect procedural fidelity measures. Procedural fidelity criterion was set to 85 percent or above. Interobserver agreement and procedural fidelity measures occurred on the same day. See Figure 4 for the procedural fidelity sheet.

Social Validity. Social validity measures were completed by both teachers and participants within the study. Social validity measures for the teachers included the Adapted Version of the Intervention Rating Profile (Whitt and Elliot, 1985) both pre and post intervention. This rating profile (Figure 5) was a scaled profile with a comments section. The scale ranged from strongly disagree-1 to strongly agree-6. It included statements such as, "I would suggest the use of this intervention to other teachers. I would be willing to use this intervention in the classroom setting. I like the procedures used in this intervention." Social validity measures for the participants included being provided with a happy face and a sad face and being asked if they enjoyed working with the researcher on learning letter sounds.

Independent Variable. The independent variable in this study was CTD implemented with fidelity. Time delay was used to implement a phonics-based reading intervention that involved teaching decoding. Decoding is the ability to isolate each sound in a word and then blend those individual sounds together to read the word. In this study only CVC words were used because when decoding CVC words each letter makes a sound and it is a typical first step after identifying letters and corresponding sounds. For a list of the words used in this study see Table 3. As previously mentioned, CTD has two rounds, a zero-delay round and a delay round. In the zero delay round the interventionist (a) laid out the CVC word, (b) used the window card to show only the first letter, (c) laid out the answer choices, (d) provided the stimulus to respond (e.g., What sound does this letter make?), (e) described the answer choices (e.g., Is it /b/ like bird, /m/ like mom, or /t/ like tree?), (f) immediately provided the controlling prompt (e.g., It's /t/ like tree, touch /t/ like tree) with modeling, and lastly (g) provided immediate reinforcement (i.e., candy, high fives, or tickles) and verbal praise (e.g., Great job that is /t/ like tree). The interventionist completed this process for every letter—isolating the second then third letter— and then the

blending of the CVC word. After the zero-delay round for the first word was completed the interventionist moved onto the delay round for that word. In the delay round the interventionist: (a) laid out the CVC word, (b) used the window card to show only the first letter, (c) laid out the answer choices, (d) provided the stimulus to respond (e.g., What sound does this letter make?), (e) described the answer choices (e.g., Is it /b/ like bird, /m/ like mom, or /t/ like tree?), (f) waited five seconds for the student to respond, (g) if the student responded correctly the interventionist moved to step j, (h) if the student attempted to respond incorrectly the interventionist moved to step j, (i) if the student did not answer the interventionist provided the controlling prompt (e.g., It's /t/ like tree, touch /t/ like tree) with modeling, and lastly (j) provided immediate reinforcement (i.e., candy, high fives, or tickles) and verbal praise (e.g., Great job that is /t/ like tree). The interventionist completed this process for every letter—isolating the second then third letter— and then the blending of the CVC word. After the zero-delay and delay rounds for the first word were completed the interventionist completed the entire process for the remaining CVC words.

Data Collection. Pre-testing occurred before data collection to see if there were any words/letter sounds the participants knew previously to eliminate bias. During baseline, the reading intervention did not take place and data were collected on the dependent variables through discrete trials. During intervention, data were collected during the delay round of the intervention.

Maintenance and Generalization. Maintenance and generalization measures were taken after there was a clear change in level in the intervention data. Maintenance conditions were the same as the baseline data collection conditions. Generalization conditions also were the same as baseline data collection conditions, but with a set of words topographically similar to the words

explicitly taught in the intervention phase. For example, if the word “cat” was used in intervention the word “cot” could be used in the generalization phase. See Table 3 for a list of all CVC words used throughout the study.

Procedures

The researcher designed all materials used for instruction, with the exception of the triangular prism from Augmentative Resource, as well as designed the intervention. The researcher also trained study staff on how to collect interobserver agreement and procedural fidelity.

Baseline. Baseline data were collected within the classroom in which the participant received ELA instruction. Baseline conditions consisted of business as usual, meaning that no zero-delay round occurred, and the participants received their normal ELA instruction. Before mid-year break both Classroom 1 and Classroom 2’s ELA instruction consisted of calendar time, letter of the week instruction, a read aloud, a brain break, and three 10-minute ELA stations (name tracing/sentence writing, sight word recognition, and leveled readers/sight word practice), and free time until the next class. After Christmas break Classroom 1’s ELA instruction consisted of 30-minute calendar, a 10-minute station, 20-minute free choice, 30-minute social stories, a 10-minute station, and 20-minute free choice. Classroom 2’s ELA instruction consisted of consisted of calendar time, letter of the week instruction, a read aloud, a brain break, and four 10-minute ELA stations (name tracing/sentence writing, sight word recognition, leveled readers/sight word practice, and reading iPad station), and free time until the next class. Every other Friday, IEP data was collected in the leveled reader/sight word practice station. Baseline data were collected during the allotted station time. Baseline data collection consisted of discrete trials of the CVC words, as seen in figure 7, and went as follows: the interventionist (1) laid out

word and answer choices; (2) covered to show only letter 1 and said “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices; (3) waited 5 seconds for the student to respond; (4) if student responded correctly marked + on data sheet, if they responded incorrectly or not at all marked – on data sheet; (5) covered to show only letter 2 and said, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices; (6) waited 5 seconds for the student to respond; (7) If student responded correctly the interventionist marked + on data sheet, if they responded incorrectly or not at all, the interventionist marked – on data sheet; (8) covered to show only letter 3 and said, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices; (9) waited 5 seconds for student to respond; (10) if student responded correctly the interventionist marked + on data sheet, if they responded incorrectly or not at all the interventionist marked – on data sheet; (11) showed the entire word card and said, “What is this word?” While pointing and labeling the choices; (12) waited 5 seconds for the student to respond; (13) if student responded correctly the interventionist marked + on data sheet, if they responded incorrectly or not at all the interventionist marked – on data sheet; and (14) repeated steps 1-13 for each of the remaining words.

Intervention. Intervention took place in a one-to-one format while the rest of the class was receiving their regular ELA instruction. Intervention took place at either a small table or the carpet depending on where the rest of the class was located. This was done to help the participant focus and to help shield other participants from the intervention as to avoid a confound of the intervention being introduced to a participant who was still in baseline. Intervention in the form of CTD with fidelity was executed one word at a time, meaning that the zero-delay round for

word one would occur followed by the delay round for that word. This process was repeated for each of the five words that were being taught to the participant. The order of words would be different every day to eliminate any effects of word order. The intervention followed the task analysis shown in Figure 6. The intervention steps were as follows: (1) the interventionist laid out the word and answer choices that consisted of the correct choice and two distractors; (2) the window card was used to isolate the first letter and the interventionist said, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]” and pointed to the correct answer; (3) the interventionist had the student respond and provide an immediate reinforcement after every answer and said, “Good job that is [Describe correct answer (ex. /b/ like bird)]”; (4) repeated steps 2-3 with each letter; (5) repeated steps 1-3 without isolating letters to show the whole word; (6) began the delay round by saying, “Now it’s your turn, I am going to show you the same word, but this time you answer”; (7) the window card was used to isolate the first letter and the interventionist said, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices; (8) waited 5 seconds for a response; (9) if the student responded correctly the interventionist marked “+” on the data sheet, provided reinforcement, and said, “Good job that is [Describe correct answer (ex. /b/ like bird)]”; (10) if the student responded incorrectly, the interventionist blocked and redirected the student to the correct response, marked “– “on data sheet, and said, “It is [Describe correct answer (ex. /b/ like bird)]”; (11) if student did not respond after five seconds the interventionist provided the

Figure 6

Task Analysis for Intervention

Zero Delay Round

1. ___ Lay out word and answer choices (1 correct and 2 distractors)
2. ___ Cover to show only letter 1; say, "Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer
3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]."
4. ___ Repeat steps 2 and 3 for the two remaining letters.
5. ___ Repeat steps 1-3 with full word.

Delay Round

6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer."
7. ___ Cover to show only letter 1, "Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices.
8. ___ Wait 5 seconds for response
9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]."
10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices.
13. ___ Wait 5 seconds for response
14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]."
15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices.
18. ___ Wait 5 seconds for response
19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]."
20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."
22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices
23. ___ Wait 5 seconds for response
24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."
25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."
26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."
27. ___ Repeat steps 1-26 for each of the remaining words.

controlling prompt with a model (e.g., It's /t/ like tree, touch /t/ like tree), ensured the student indicated the correct response, and marked "– "on data sheet; (12-21) the interventionist would repeat steps 7-11 for the other two letters; (22-26) the interventionist would repeat steps 7-11 for the entire word; (27) the interventionist would repeat steps 1-26 for each of the remaining words.

Reinforcements were different for each participant. Super Hero chose each day between earning classroom behavior supports (bubble gum tokens), tickles, or high fives. Ninja Turtle received high fives with positive praise and smiles. Ben Ten received mini chocolate candies and high fives. Each reinforcer was paired with a specific praise statement (e.g., "Good job, that's /b/ like bird.").

Maintenance and Generalization. Maintenance and generalization occurred after the student had a clear change in trend and level and followed an approximately 2 week break on all study instruction. Theetask analysis for maintenance and generalization (Figure 7) were followed. Maintenance was assessed on the intervention words and generalization was assessed on five CVC words that had not been previously taught but were topographically similar (i.e., contained letters that intervention words had) (Table 3). Maintenance and generalization steps were as follows: the interventionist (1) laid out word and answer choices; (2) covered to show only letter 1 and said "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices; (3) waited 5 seconds for the student to respond; (4) if student responded correctly marked + on data sheet, if they responded incorrectly or not at all marked – on data sheet; (5) covered to show only letter 2 and said, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices; (6) waited 5 seconds for the student to respond; (7) If student responded correctly marked + on data sheet, if they responded incorrectly or not at

all marked – on data sheet; (8) covered to show only letter 3 and said, “Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices; (9) waited 5 seconds for student to respond; (10) if student responded correctly marked + on data sheet, if they responded incorrectly or not at all marked – on data sheet; (11) showed the entire word card and said, “What is this word?” While pointing and labeling the choices; (12) waited 5 seconds for the student to respond; (13) if student responded correctly marked + on data sheet, if they responded incorrectly or not at all marked – on data sheet; and (14) repeated steps 1-13 for each of the remaining words.

Figure 7

Task Analysis for Baseline, Maintenance, and Generalization

1. ___ Lay out word and answer choices
2. ___ Cover to show only letter 1, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices.
3. ___ Wait 5 seconds for response
4. ___ If student responds correctly mark + on data sheet, if they respond incorrectly or not at all mark – on data sheet
5. ___ Cover to show only letter 2, Say, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices.
6. ___ Wait 5 seconds for response
7. ___ If student responds correctly mark + on data sheet, if they respond incorrectly or not at all mark – on data sheet
8. ___ Cover to show only letter 3, Say, “Which sound does this letter make? Is it [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]” while pointing to the answer choices.
9. ___ Wait 5 seconds for response
10. ___ If student responds correctly mark + on data sheet, if they respond incorrectly or not at all mark – on data sheet
11. ___ Show the entire word card, Say, “What is this word? While pointing and labeling the choices
12. ___ Wait 5 seconds for response
13. ___ If student responds correctly mark + on data sheet, if they respond incorrectly or not at all mark – on data sheet
14. ___ Repeat steps 1-13 for each of the remaining words.

Chapter 4: Results

The study findings are listed below in the following order: first the results for each participant, followed by interobserver agreement, procedural fidelity, social validity, and effect size.

Participants

The following are the results for each of the participants. The order will follow the intervention order: Super Hero, Ninja Turtle, Ben Ten, and Mickey Mouse.

Super Hero. Below are the results for Super Hero described in terms of range and mean for baseline, intervention, maintenance, and generalization phases.

Baseline. Baseline measures for Super Hero included the percent of correctly identified letter sounds (Figure 8 and 9) and the percent of correctly identified whole word blend. Baseline measures, consisting of five data points, for letter sounds correctly identified ranged from 13.3 percent to 33.3 percent with the mean being 25.3 percent of letter sounds correctly identified. Baseline measures for whole word blends correctly identified ranged from 20 percent to 60 percent with the mean being 32 percent of whole word blends correctly identified.

Intervention. Intervention measures for Super Hero included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Intervention measures, consisting of 18 data points, for letter sounds correctly identified ranged from 13.3 percent to 100 percent with the mean being 58.5 percent of letter sounds correctly identified. Intervention measures for whole word blends correctly identified ranged from 0

percent to 80 percent with the mean being 54.4 percent of whole word blends correctly identified.

Super Hero was removed from the room from probes 9 through 18 due to aggressive and distracting behavior of another student in the classroom. During these sessions Super Hero received instruction at the table in the common area of pod D until he started to show progress, and then he was placed back in the classroom for the remainder of data collection. These disruptions caused Super Hero to lose focus during both the zero-delay and delay rounds. In the zero-delay round the interventionist would often have to redirect Super Hero multiple times. In the delay round, Super Hero would often be marked as incorrect as he would lose focus and be distracted by the other student's behavior which would result in more incorrect responses.

Maintenance. Maintenance measures for Super Hero included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Maintenance measures, consisting of four data points, for letter sounds correctly identified ranged from 26.7 percent to 80 percent with the mean being 56.7 percent of letter sounds correctly identified. Maintenance measures for whole word blends correctly identified ranged from 20 percent to 80 percent with the mean being 55 percent of whole word blends correctly identified.

Generalization. Generalization measures for Super Hero included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Generalization measures, consisting of three data points, for letter sounds correctly identified ranged from 40 percent to 66.7 percent with the mean being 53.3 percent of letter sounds correctly identified. Generalization measures for whole word blends correctly identified ranged

from 20 percent to 60 percent with the mean being 40 percent of whole word blends correctly identified.

Interobserver Agreement (IOA). IOA was conducted by two study staff approved by the IRB. IOA measures for Super Hero were taken on 40% of probes (i.e., 3, 6, 9, 12, 15, 17, 21, 23, 27, 30, 32, and 34). Results of the IOA measures ranged from 90 to 100 percent with a mean of 99.2 percent agreement. An overview of the IOA data can be seen in Table 4.

Table 4

IOA Data

Participant	*Time Collected*	*Minimum*	*Maximum*	*Mean*
Super Hero	40%	90%	100%	99.2%
Ninja Turtle	33.3%	100%	100%	100%
Ben Ten	32.1%	100%	100%	100%
Mickey Mouse	28.6%	100%	100%	100%
All	31%	100%	100%	100%

Anytime another person was watching him (e.g., interobserver agreement, procedural fidelity sessions) Super Hero would refuse to participate, try to run away, purposefully choose the incorrect answer and laugh, or engage in other off-task behaviors. Due to these behaviors there was a consistent drop in data on days that interobserver agreement and procedural fidelity measures happened. It was possible that he was participating in attention seeking behaviors,

which caused him not to respond as he had when outsider observers were not in attendance. It is rather obvious on the graph in probes 6, 9, 15, 17, 23 and 32.

Ninja Turtle. Below are the results for Ninja Turtle described in terms of range and mean for baseline, intervention, maintenance, and generalization phases.

Baseline. Baseline measures for Ninja Turtle included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Baseline measures, consisting of eight data points, for letter sounds correctly identified ranged from 6.7 percent to 40 percent with the mean being 23.3 percent of letter sounds correctly identified. Baseline measures for whole word blends correctly identified ranged from 0 percent to 100 percent with the mean being 42.5 percent of whole word blends correctly identified.

Intervention. Intervention measures for Ninja Turtle included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Intervention measures, consisting of 11 data points, for letter sounds correctly identified ranged from 40 percent to 100 percent with the mean being 73.4 percent of letter sounds correctly identified. Intervention measures for whole word blends correctly identified ranged from 20 percent to 100 percent with the mean being 72.7 percent of whole word blends correctly identified.

Maintenance. Maintenance measures for Ninja Turtle included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Maintenance measures, consisting of three data points, for letter sounds correctly identified ranged from 66.7 percent to 100 percent with the mean being 88.9 percent of letter sounds correctly identified. Maintenance measures for whole word blends correctly identified ranged

from 80 percent to 100 percent with the mean being 93.3 percent of whole word blends correctly identified.

Generalization. Generalization measures for Ninja Turtle included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Generalization measures, consisting of three data points, for letter sounds correctly identified ranged from 77.8 percent to 93.3 percent with the mean being 88.1 percent of letter sounds correctly identified. Generalization measures for whole word blends correctly identified ranged from 66.7 percent to 100 percent with the mean being 88.9 percent of whole word blends correctly identified.

Interobserver Agreement (IOA). IOA was conducted by two study staff approved by the IRB. IOA measures for Ninja Turtle were taken on 33.3% of probes (i.e., 3, 15, 17, 21, 23, 27, 30, 32, and 38),. Results of the IOA measures were all at 100 percent agreement. An overview of the IOA data can be seen in Table 4.

Ben Ten. Below are the results for Ben Ten described in terms of range and mean for baseline, intervention, maintenance, and generalization phases.

Baseline. Baseline measures for Ben Ten included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Baseline measures, consisting of 11 data points, for letter sounds correctly identified ranged from 6.7 percent to 46.7 percent with the mean being 27.9 percent of letter sounds correctly identified. Baseline measures for whole word blends correctly identified ranged from 0 percent to 80 percent with the mean being 47.3 percent of whole word blends correctly identified.

Intervention. Intervention measures for Ben Ten included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Intervention measures, consisting of 11 data points, for letter sounds correctly identified ranged from 26.7 percent to 100 percent with the mean being 62.4 percent of letter sounds correctly identified. Intervention measures for whole word blends correctly identified ranged from 20 percent to 100 percent with the mean being 58.2 percent of whole word blends correctly identified.

After mid-year break when he was relocated to Classroom 2 he was in the same class as a student with Prader-Willi Syndrome. From probe 33 to probe 38 Ben Ten was moved to the table in the common area as well because his preferred reinforcer (e.g., mini chocolate candies) was not allowed in the classroom due to another student's disability and dietary restrictions. After probe 38, Ben Ten returned to the classroom to receive intervention and his reinforcer transitioned to high fives and positive praise. While removed from the classroom Ben Ten received both mini chocolate candies and high fives as reinforcements. This was to help to transition him from edibles (e.g., mini chocolate candies) to more natural reinforcers (e.g., high fives and verbal praise).

Maintenance. Maintenance measures for Ben Ten included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Maintenance measures, consisting of three data points, for letter sounds correctly identified ranged from 73.3 percent to 93.3 percent with the mean being 82.8 percent of letter sounds correctly identified. Maintenance measures for whole word blends correctly identified ranged from 80 percent to 100 percent with the mean being 93.3 percent of whole word blends correctly identified.

Generalization. Generalization measures for Ben Ten included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Generalization measures, consisting of three data points, for letter sounds correctly identified ranged from 80 percent to 86.7 percent with the mean being 84.5 percent of letter sounds correctly identified. Generalization measures for whole word blends correctly identified ranged from 80 percent to 100 percent with the mean being 93.3 percent of whole word blends correctly identified.

Interobserver Agreement (IOA). IOA was conducted by two study staff approved by the IRB. IOA measures for Ben Ten were taken on 32.1% of probes (i.e., 3, 15, 17, 27, 30, 32, 34, 38 and 39).Results of the IOA measures were all at 100 percent agreement. An overview of the IOA data can be seen in Table 4.

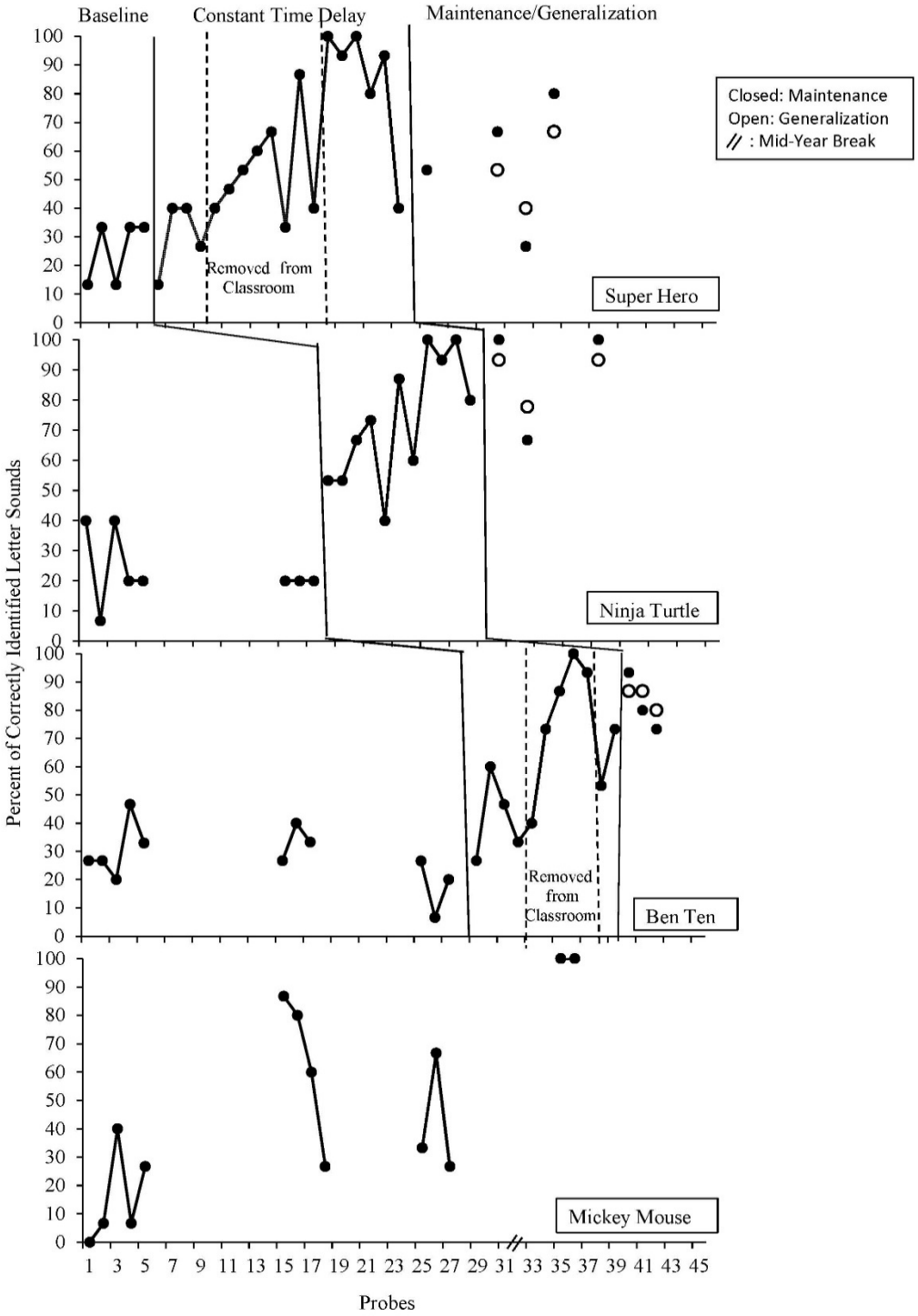
Mickey Mouse. Below are the results for Mickey Mouse which consisted of only baseline measures. Due to high baseline measures no other data was collected for Mickey Mouse

Baseline. Baseline measures for Mickey Mouse included the percent of correctly identified letter sounds (Figure 8) and the percent of correctly identified whole word blend. Baseline measures, consisting of 14 data points, for letter sounds correctly identified ranged from 0 percent to 100 percent with the mean being 47.2 percent of letter sounds correctly identified. Baseline measures for whole word blends correctly identified ranged from 0 percent to 100 percent with the mean being 35.7 percent of whole word blends correctly identified.

Mickey Mouse did not advance into intervention due to his baseline trend increasing. As the researcher continued to work with Mickey Mouse, he became accustomed to her expectations

Figure 8

Graph of all Participant Data



and often turned his tablet off or willingly provided it to the researcher to hold (probes 15, 16, 35, and 36). After the mid-year break, when he was in the smaller "behavior class", he was probed again for baseline and correctly identified all letter sounds and CVC words for two probes in a row. Due to his knowledge of words and letter sounds he no longer met the inclusion criteria for the study and did not receive the intervention.

Interobserver Agreement (IOA). IOA was conducted by two study staff approved by the IRB. IOA measures for Mickey Mouse were taken on 28.6% of probes (i.e., 3, 15, 17, and 27). Results of the IOA measures were all at 100 percent agreement. An overview of the IOA data can be seen in Table 4.

Effect Size

Effect size was calculated using the Tau-U Online Calculator for Single Case Design (Vannest, Parker, Gonen, & Adiguzel, 2016). Results of these calculations can be seen in Table 5. Results for the entire study include a 0.86 Omnibus effect size and a 0.0 p-value with a confidence interval at 90 percent for the percentage of letter sounds correctly identified.

Table 5

Tau-U Data

Dependent Variable	*Effect Size*	*Number of Participants*	*P-Value*	*CI 90%*
Percentage of letter sounds correctly identified	0.8628	3	0.0	0.6009<>1

Interobserver Agreement

Interobserver Agreement (IOA) measures were taken for 13 out of the 42 probes, which is 31 percent of all probes, and results of the IOA measures ranged from 94 percent to 100 percent with a mean of 99.5 percent agreement. An overview of the IOA data can be seen in Table 4.

Procedural Fidelity

Procedural Fidelity (PF) measures were taken for 13 out of the 42 probes, which is 31 percent of all probes, and results of the PF measures ranged from 98 percent to 100 percent with a mean of 99.8 percent fidelity.

Social Validity

Social Validity measure were gathered from the teachers of both classrooms, Mrs. G and Mrs. B, before and after the intervention. Data were also gathered from participants post intervention. The results are described below.

Teachers. Mrs. G strongly agreed that the intervention was socially valid before and after the intervention. She scored all 15 statements at 6 (strongly agree) through the survey both before and after the intervention. Before the intervention she wrote. “This intervention will become more effective as the students continue to become familiar with the procedures and vocabulary used during the intervention.” After the intervention Mrs. G wrote, “This intervention was very effective for my students. They enjoyed the pictures, and the simplicity of [the] materials met their needs and allowed them to work at their full potential.” Mrs. B strongly agreed that the intervention was socially valid before the intervention. She scored the 15 statements between 5 (agree) and 6 (strongly agree), with a mean of 5.6, and a mode of 6. She had no written comments before intervention. After the intervention, Mrs. B strongly agreed that

the intervention was socially valid. She scored the 15 statements between 5 and 6, with a mean of 5.93, and a mode of 6. She wrote, “I thought this was a great intervention for teaching letter sounds.” Overall, both teachers identified the intervention as being strongly socially valid both before and after the intervention and stated that the intervention was effective for their students.

Participants. Super Hero and Ninja Turtle responded positively indicating the happy face along with saying yes, nodding their head, and smiling. Ben Ten responded negatively indicating the sad face and saying no while shaking his head.

Chapter 5: Discussion

The purposes of this study were (1) to determine if teaching decoding through constant time delay is effective in teaching students with severe disabilities and verbal difficulties (a) letter sounds within consonant vowel consonant (CVC) words, (b) to read CVC words, and (2) to determine if teaching decoding through constant time delay builds independent reading and decoding skills in students with severe disabilities and verbal difficulties. A multiple probe across participants single case design was used to evaluate the effect of the independent variable (i.e., constant time day) on the dependent variable (i.e., participants ability to decode and read words). The intervention was completed with three kindergarten through third grade students with severe disabilities— including intellectual disability, developmental delay, and autism—and verbal difficulties. The results indicated that there was a functional relation between decoding instruction through constant time delay and the participants ability to decode and read consonant-vowel-consonant (CVC) words. Additionally, students were able to maintain and generalize the skill to CVC words that had not been previously taught. Social validity measures indicated classroom teachers believed this was an intervention they could implement in their classrooms, and two of the three participants indicated that they enjoyed the intervention. The following discussion of the study includes the external factors, effects of the intervention on the dependent variable, limitations, implications for future research, and implications for practice.

Effects of the Intervention on the Dependent Variable

The intervention in this study, constant time delay, had a positive effect on the dependent variable (i.e., participants' ability to decode and read CVC words). This can be seen in the positive trend of the participants' correctly identified letter sounds in Figure 9. It should be noted

that participants were provided with three answer choices during all phases and thus there is a 33.3 percent chance of answering correctly due to guessing. The positive trend allowed for a functional relationship between teaching decoding through constant time delay and the participants' ability to decode and read CVC words. The intervention also allowed for participants to generalize the skill to words that had not been explicitly taught but contained the same letters as previous words.

Results in this study mirrored other studies which implemented time delay to promote emergent literacy skills. (Ahlgrim-Delzell et al., 2016; Ahlgrim-Delzell et al., 2014a; Browder et al., 2012; Johnson et al, 2009b; Tucker Cohen et al., 2008). Results from this study mirror those in the Ahlgrim-Delzell et al. (2016) study. This is because both studies utilized time delay to teach similar early literacy skills (i.e. letter-sound recognition/phoneme identification, blending sounds to identify words, and decoding for picture-word-matching) to students who struggled with clear vocal verbal skills. However, the current study extended the Ahlgrim-Delzell et al. (2016) study by using only CTD and by using more cost-effective materials.

Additionally, Ahlgrim-Delzell et al. (2014a), used the GoTalk Phonics curriculum, which uses time delay as an instructional component, to teach phoneme identification, blending sounds to form words, and blending sounds to form words with picture referents. This study mirrors the results of the Ahlgrim-Delzell et al. (2014a) study in that the current study also utilized time delay to teach similar early literacy skills (i.e. letter-sound recognition/phoneme identification, blending sounds to identify words, and decoding for picture-word-matching). The current study differed from Ahlgrim-Delzell et al. (2014a) in that it utilized only CTD as in instructional method and is easily replicable.

As indicated earlier, Browder et al. (2012), used a multicomponent early literacy program that utilized constant time delay to teach a variety of phonics related skills. Similar results were found in the current study, which also employed CTD to teach similar skills. While the Browder et al. (2012) study was very effective, the packaged curriculum could be seen as a barrier to some teachers. The current study employed a cost effective and easy to create intervention. While the current study had strong results for teaching letter sounds and CVC words, it was not nearly as comprehensive as the ELSB intervention used in the Browder et al. (2012) study.

The results of this study can also be compared to a study by Johnston et al. (2009b) who also employed CTD with four instructional activities to teach letter sound correspondence and consonant-vowel-consonant words and nonwords to young children who use AAC devices. The current study added to the Johnston et al. (2009b) study by teaching more words, focusing on students with severe disabilities and verbal difficulties, and teaching the intervention within the regular literacy instruction time. While the current study was effective in teaching letter sounds and CVC words, it may not have been as engaging to participants as the Johnston et al. (2009b) study.

Finally, Tucker Cohen et al. (2008), use a three-step decoding strategy with constant time delay to teach word reading to students with mild to moderate intellectual disability. The results in this this study found similar results when utilizing constant time delay to teach decoding. Although, the current study implemented the strategy with students with more significant disabilities as the Cohen et al study was focused on students with mild to moderate ID. Additionally, the current study focused on CVC words (versus non-CVC words).

This study also followed literature reviews and meta-analysis articles' calls for additional research in early literacy skill instruction for individuals with severe disabilities (Browder et al,

2009a; Dessemont et al., 2019) Additionally, this study's adherence to the quality for single case design help to provide another strong example that decoding skills can be taught to students with significant disabilities.

Limitations

There were a few limitations within this study. First, two participants were removed from their natural learning environment during a portion of the intervention. The removal of these students from their natural learning environment created a possibility of confounds. It could be that these participants were only able to acquire the skill because they were placed in a minimally distractive environment. Although, theses participants were able to show generalization of the intervention to a new setting, however, it was not ideal given the focus was to identify the intervention was effective in the natural setting. However, the researcher did phase the participants back into the natural learning environment after they showed growth in skill acquisition, and the participants did not show regression after transitioning back to the natural learning environment.

Another limitation was Super Hero's reaction to the study staff when collecting interobserver agreement (IOA) and procedural fidelity (PF) measures. Super Hero did react well to another person being present when receiving one-on-one instruction and engaged in off task behaviors which skewed the data. This was consistent across any time that IOA and PF was conducted as well as when a teacher or paraprofessional observed the intervention. Ideally, a student should be able to respond consistently to an intervention regardless of who is in the room.

Mickey Mouse's increasing baseline provided another limitation. Although Mickey Mouse was not exposed to the intervention, his baseline increased through the study. This could

be because Mickey Mouse become more comfortable with the interventionist and rose to meet the interventionist's high expectations. It could also be that the study materials allowed Mickey Mouse to show what he knew in a format that had not previously been used in assessments and within the classroom.

Another limitation was the small sample size. A minimum of three participants is needed to show a functional relationship in a multiple probe across participants research design. Ideally, the sample size would include more than three participants to show a stronger functional relationship. However, due to the specific inclusion criteria of the study there were few students who met the criteria within the geographic region. Future research should investigate the effects of the intervention with a larger sample size as well as different group sizes (e.g., small group, large group).

A final limitation was the interventionist was the lead researcher versus the classroom teacher. Future research should investigate the effects of the teacher or teacher assistant implemented intervention on the student's ability to decode CVC words.

Recommendations for Future Research

The results in this study were similar to other studies which implemented time delay to teach early literacy skills (Ahlgrim-Delzell et al., 2016; Ahlgrim-Delzell et al., 2014a; Browder et al., 2012; Johnson et al, 2009b; Tucker Cohen et al., 2008) and followed the call for researchers to investigate early literacy instruction (i.e., phonics and decoding skills) to students with severe disabilities (Browder et al, 2009a; Dessemont et al., 2019). This study will add to the evidence base for using constant time delay to teach early literacy skills to students with severe disabilities and verbal difficulties (Browder et al. 2009a) and add the research regarding teaching decoding though constant time delay to students with severe disabilities and verbal difficulties.

Few studies exist regarding teaching phonics and decoding to student with severe disabilities and verbal difficulties (Dessemont et al., 2019). Future studies should expand upon this study by teaching consonant-consonant-vowel-consonant words, consonant-vowel-consonant-consonant words, or teaching letter blends to students (i.e., “ai” makes /ā/, “wh” makes /ŵ/ etc.). Future research should also focus on adding to the research regarding teaching decoding through constant time delay to students with severe disabilities and verbal difficulties by replicating this study and using different age groups, students with different disabilities, and as mentioned above, different grouping formats. Future research could also expand upon this study by investigating if after being taught to decode words, students with severe disabilities and verbal difficulties are able to read independently and/or match words read aloud by the teacher to the written word. Finally, future research should investigate the effects of this intervention in inclusive classrooms using embedded instruction.

Implications for Practice

This study along with others (Ahlgrim-Delzell et al., 2016; Ahlgrim-Delzell et al., 2014a; Browder et al., 2012; Johnson et al, 2009b; Tucker Cohen et al., 2008) provide critical evidence that students with severe disabilities should be taught more early literacy skills in addition to sight words instruction. This study also supports that idea that students with verbal difficulties (i.e. non-vocal/verbal) can learn early literacy skills such as decoding when using strong evidence-based practices like constant time delay. Due to the simplicity of the materials and ease of implementing constant time delay, this intervention could be easily implemented in any classroom by teachers, paraprofessionals, or even peers without disabilities. In fact, the classroom teachers in the study indicated that the intervention was “great” and “very effective”.

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APPENDICES

Appendix A: Figure 4

Figure 4

Procedural Fidelity Sheet

CVC Words- Intervention Procedural Fidelity

✖ = Incorrect/doesn't perform
✓= Performs step correctly
Ø = N/A

Date: _____ Observer: _____ Interventionist: _____

Lesson Components	Teacher Response	Notes:
1st Word	Zero Delay Round 1. ___ Lay out word and answer choices (1 correct and 2 distractors) 2. ___ Cover to show only letter 1; say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer 3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 4. ___ Repeat steps 2 and 3 for the two remaining letters. 5. ___ Repeat steps 1-3 with full word. Delay Round 6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer." 7. ___ Cover to show only letter 1, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 8. ___ Wait 5 seconds for response 9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 13. ___ Wait 5 seconds for response 14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices.	

	18. ___ Wait 5 seconds for response 19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices 23. ___ Wait 5 seconds for response 24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."	
2nd Word	Zero Delay Round 1. ___ Lay out word and answer choices (1 correct and 2 distractors) 2. ___ Cover to show only letter 1; say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer 3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 4. ___ Repeat steps 2 and 3 for the two remaining letters. 5. ___ Repeat steps 1-3 with full word. Delay Round 6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer." 7. ___ Cover to show only letter 1, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 8. ___ Wait 5 seconds for response 9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."	

	12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 13. ___ Wait 5 seconds for response 14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 18. ___ Wait 5 seconds for response 19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices 23. ___ Wait 5 seconds for response 24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."	
3rd Word	Zero Delay Round 1. ___ Lay out word and answer choices (1 correct and 2 distractors) 2. ___ Cover to show only letter 1; say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer 3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 4. ___ Repeat steps 2 and 3 for the two remaining letters. 5. ___ Repeat steps 1-3 with full word. Delay Round	

	6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer." 7. ___ Cover to show only letter 1, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 8. ___ Wait 5 seconds for response 9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 13. ___ Wait 5 seconds for response 14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 18. ___ Wait 5 seconds for response 19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices 23. ___ Wait 5 seconds for response 24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."	

4th Word	Zero Delay Round 1. ___ Lay out word and answer choices (1 correct and 2 distractors) 2. ___ Cover to show only letter 1; say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer 3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 4. ___ Repeat steps 2 and 3 for the two remaining letters. 5. ___ Repeat steps 1-3 with full word. Delay Round 6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer." 7. ___ Cover to show only letter 1, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 8. ___ Wait 5 seconds for response 9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 13. ___ Wait 5 seconds for response 14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 18. ___ Wait 5 seconds for response 19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]."	

	21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices 23. ___ Wait 5 seconds for response 24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."	
5th Word	Zero Delay Round 1. ___ Lay out word and answer choices (1 correct and 2 distractors) 2. ___ Cover to show only letter 1; say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]? It is [Describe correct answer (ex. /b/ like bird)]." then point to the correct answer 3. ___ Have the student respond and provide an immediate reinforcement after every answer and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 4. ___ Repeat steps 2 and 3 for the two remaining letters. 5. ___ Repeat steps 1-3 with full word. Delay Round 6. ___ Say, "Now it's your turn, I am going to show you the same word, but this time you answer." 7. ___ Cover to show only letter 1, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 8. ___ Wait 5 seconds for response 9. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 10. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 11. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 12. ___ Cover to show only letter 2, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 13. ___ Wait 5 seconds for response 14. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]."	

	15. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 16. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 17. ___ Cover to show only letter 3, Say, "Which sound does this letter make? It is [Describe cards (ex. /d/ like duck, /b/ like bird, or /p/ like pig)]" while pointing to the answer choices. 18. ___ Wait 5 seconds for response 19. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer (ex. /b/ like bird)]." 20. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 21. ___ If student does not respond after set time: touch the correct response, have student indicate correct response, mark – on data sheet, and say, "It is [Describe correct answer (ex. /b/ like bird)]." 22. ___ Show the entire word card, Say, "What is this word? While pointing and labeling the choices 23. ___ Wait 5 seconds for response 24. ___ If student responds correctly: mark + on data sheet, provide reinforcement, and say, "Good job that is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 25. ___ If the student responds incorrectly: block and redirect to the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]." 26. ___ If student does not respond after set time: touch the correct response, have student indicate the correct response, mark – on data sheet, and say, "It is [Describe correct answer choice (ex. /b/ /ă/ /t/, bat)]."	
	Total steps implemented correctly _____	

Appendix B: Figure 5

Figure 5

Social Validity Measures

PRE-INTERVENTION

Circle Student: A B C D E

Date

Adapted Version of the Intervention Rating Profile-15

The purpose of this questionnaire is to obtain information that will aid in the selection of future classroom interventions. These interventions will be used by teachers of children with identified needs. Please circle the number which best describes your agreement or disagreement with each statement.

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree
1. This would be an acceptable intervention for the child's needs.	1	2	3	4	5	6
2. Most teachers would find this intervention appropriate for children with similar needs.	1	2	3	4	5	6
3. This intervention should prove effective in supporting the child's needs.	1	2	3	4	5	6
4. I would suggest the use of this intervention to other teachers.	1	2	3	4	5	6
5. The child's needs are severe enough to warrant use of this intervention.	1	2	3	4	5	6
6. Most teachers would find this intervention suitable for the needs of this child.	1	2	3	4	5	6
7. I would be willing to use this intervention in the classroom setting.	1	2	3	4	5	6
8. This intervention would *not* result in negative side effects for the child.	1	2	3	4	5	6
9. This intervention would be appropriate for a variety of children.	1	2	3	4	5	6
10. This intervention is consistent with those I have used in classroom settings.	1	2	3	4	5	6
11. The intervention is a fair way to handle the child's needs.	1	2	3	4	5	6
12. This intervention is reasonable for the needs of the child.	1	2	3	4	5	6
13. I like the procedures used in this intervention.	1	2	3	4	5	6
14. This intervention would be a good way to handle this child's needs.	1	2	3	4	5	6
15. Overall, this intervention would be beneficial for the child.	1	2	3	4	5	6

Total (sum all points circled; higher scores indicate higher acceptability; range = 15-90): _____

Comments: _____

_____

Source: Adapted from Witt, J.C. & Elliott, S.N. (1985). Acceptability of classroom intervention strategies. In Kratochwill, T.R. (Ed.), *Advances in School Psychology, Vol. 4*, 251 – 288. Mahwah, NJ: Erlbaum. Reproduced under Fair Use of copyrighted materials for education, scholarship, and research. 17 U.S.C. § 107

POST-INTERVENTION

Circle Student: A B C D E

Date

Adapted Version of the Intervention Rating Profile-15

The purpose of this questionnaire is to obtain information that will aid in the selection of future classroom interventions. These interventions will be used by teachers of children with identified needs. Please circle the number which best describes your agreement or disagreement with each statement.

	Strongly disagree	*Disagree*	*Slightly disagree*	*Slightly agree*	*Agree*	*Strongly agree*
1. This was an acceptable intervention for the child's needs.	1	2	3	4	5	6
2. Most teachers would find this intervention appropriate for children with similar needs.	1	2	3	4	5	6
3. This intervention proved effective in supporting the child's needs	1	2	3	4	5	6
4. I would suggest the use of this intervention to other teachers.	1	2	3	4	5	6
5. The child's needs were severe enough to warrant use of this intervention.	1	2	3	4	5	6
6. Most teachers would find this intervention suitable for the needs of this child.	1	2	3	4	5	6
7. I would be willing to use this intervention in the classroom setting.	1	2	3	4	5	6
8. This intervention did *not* result in negative side effects for the child.	1	2	3	4	5	6
9. This intervention would be appropriate for a variety of children.	1	2	3	4	5	6
10. This intervention was consistent with those I have used in classroom settings.	1	2	3	4	5	6
11. The intervention was a fair way to handle the child's needs.	1	2	3	4	5	6
12. This intervention was reasonable for the needs of the child.	1	2	3	4	5	6
13. I liked the procedures used in this intervention.	1	2	3	4	5	6
14. This intervention was a good way to handle this child's needs.	1	2	3	4	5	6
15. Overall, this intervention was beneficial for the child.	1	2	3	4	5	6

Total (sum all points circled; higher scores indicate higher acceptability; range = 15-90): _____

Comments: _____

_____

Source: Adapted from Witt, J.C. & Elliott, S.N. (1985). Acceptability of classroom intervention strategies. In Kratochwill, T.R. (Ed.), *Advances in School Psychology, Vol. 4*, 251 – 288. Mahwah, NJ: Erlbaum. Reproduced under Fair Use of copyrighted materials for education, scholarship, and research. 17 U.S.C. § 107

VITA

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Education:

Comprehensive Diploma, Todd County Central High School, Elkton, Kentucky 2014

B.S. Special Education, East Tennessee State University, Johnson City, Tennessee 2018

M.Ed. Special Education, East Tennessee State University, Johnson City, Tennessee 2020

Professional Experience:

Cabin Supervisor and Camp Counselor, Camp Discovery, Gainesboro, Tennessee 2014-2016

Student Worker, East Tennessee State University- Department of Sustainability, Johnson City, Tennessee 2014-2018

Resident Advisor, East Tennessee State University- Department of Housing and Resident Life, Johnson City, Tennessee 2015-2017

Substitute Teacher, Johnson City School, Johnson City, Tennessee 2016-2017

Assistant Manager and Crew Worker, Little Caesar's Pizza, Johnson City, Tennessee, 2017-2018

Graduate Assistant, East Tennessee State University- Department of Sustainability, Johnson City, Tennessee 2018-2019

Graduate Assistant, East Tennessee State University- Department of Educational Foundations and Special Education, Johnson City, Tennessee, 2019-2020

Honors and Awards:

Council for Exceptional Children's Teacher Education Division-
Kaleidoscope Poster Competition, Best Single Case Design

3 Minute Thesis Competition, East Tennessee State University-
Heat Two, 2nd Place

East Tennessee State University, Cum Laude